EXHIBIT I

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Kineticorp™

Forensic Engineering | and Visualization

May 6th, 2019

Edward Bott
Greensfelder, Hemker & Gale, P.C.
10 South Broadway
Suite 2000
St. Louis, MO 63102

RE: RYSTA LEONA SUSMAN, ET AL. VS. THE GOODYEAR TIRE & RUBBER COMPANY

Dear Mr. Bott,

As requested, I analyzed a single vehicle crash that occurred at approximately 6:57 am on May 1st, 2015. The crash occurred on Eastbound interstate 80 (I-80) near mile post 294. A 2003 Chevrolet Silverado driven by Larry Blair, was traveling eastbound. The rear right tire experienced a partial tread separation. Mr. Blair steered the vehicle off the right side of the road, then to the left across both lanes into the median where it rolled over. In the area of the crash, I-80 is a two-lane highway in each direction with a speed limit of 75 miles per hour (mph). The roadway is bordered on the right by an asphalt shoulder and a grassy median separates the eastbound and westbound lanes. Figure 1 depicts the roadway in the area of the crash.

Figure 1

Summary of Conclusions: As a result of my investigation and analysis, I reached the following conclusions related to this crash:

1. Mr. Blair was driving the Silverado eastbound on I-80 at approximately 78 mph. The speed limit was 75 mph.

2. The Silverado was reportedly traveling in the left lane (#1) passing another vehicle. After completing the pass, the Silverado was in the process of returning to the right lane (#2) when Mr. Blair reported experiencing the vehicle shaking.

3. The right rear tire then experienced a partial tread separation while remaining inflated.

4. In response to the tire disablement, Mr. Blair steered multiple times. His right steering input caused the vehicle to exit the right side of the #2 lane. Mr. Blair then steered to the left, which caused the Silverado to yaw counter-clockwise and deposit tire marks across both eastbound lanes, before entering the median and rolling over.

5. Near the beginning of the tire mark evidence, Mr. Blair improperly applied the throttle.

6. This crash was caused by the Mr. Blair steering excessively following the tire disablement.

7. It could not be ruled out that Mr. Blair's pedal misapplication contributed to him losing control of his vehicle.

8. Mr. Blair could have kept the Silverado within its lane of travel with minor corrective steering.

9. The Silverado was controllable before, during and after the tire disablement.

10. I have performed tread separation testing with several vehicles. In all tests, the vehicle was kept within its lane of travel with minor corrective steering. My testing was consistent with testing performed by other researchers.

Basis for Conclusions: The remainder of this report describes the basis for these conclusions and outlines the procedure through which they were reached. The procedure described below utilized reliable methods, techniques and processes which conform to standard and accepted practices within the field of vehicle dynamics analysis. The above-listed conclusions, to which this procedure led, were reached to a reasonable degree of engineering certainty.

<u>Procedure:</u>

- In conducting our investigation and analysis, Kineticorp reviewed and analyzed the materials listed in Appendix A of this report. These materials were provided to Kineticorp.

- Kineticorp inspected, documented and photographed the crash site on August 31th, 2018 and April 17, 2019.

- I inspected the subject Silverado on October 4, 2018.

- I inspected the subject and companion tires on November 21, 2018.

- Kineticorp obtained manufacturer specifications for the subject Chevrolet Silverado.

- I analyzed Mr. Blair's ability to keep the vehicle under control during and following a tire disablement. This analysis relied on our own research in the area of tire disablements and the technical literature, including the following:

  - Baker, J. Stannard, "Tire Disablements and Accidents on a High-Speed Road," The Traffic Institute's Tire Study, April 1968.

  - Beauchamp, G., Koch, D., and Thornton, D., "A Comparison of 25 High Speed Tire Disablements Involving Full and Partial Tread Separations," *SAE Int. J. Trans. Safety* 1(2):364-385, 2013, doi:10.4271/2013-01-0776.

  - Gardner, Jim. "The Role of Blowouts in Accident Causation," Publication no. 87-WA/SAF-4. New York City: American Society of Mechanical Engineers, 1987.

  - Gardner, Jim. "The Role of Tread/Belt Detachment in Accident Causation," ITEC 1998, Paper 27A.

  - Gardner, J.D., Queiser, B.J., 2006. "The Pneumatic Tire," Report DOT HS 810 561, US Department of Transportation, National Highway Traffic Safety Administration, Washington, DC, USA, February 2006, ch 15.

  - Gillespie, Thomas D., Fundamentals of Vehicle Dynamics, Society of Automotive Engineers Warrendale, PA, 1992.

  - Fay, R., Robinette, R., Smith, J., Flood, T. et al., "Drag and Steering Effects from Tire Tread Belt Separation and Loss," SAE Technical Paper 1999-01-0447, 1999, doi:10.4271/1999-01-0447.

  - Klein, E. and Black, T., "Anatomy of Accidents Following Tire Disablements", SAE Technical Paper 1999-01-0446, 1999, doi:10.4271/1999-01-0446.

  - Koch, D., Beauchamp, G., and Pentecost, D., "Deceleration Rates of Vehicles with Disabled Tires," SAE Technical Paper 2017-01-1427, 2017, doi: 4271/2017-01-1427.

  - Liu, C., Ye, T.J., "Run-Off-Road Crashes: An On Scene Perspective," NHTSA DOT HS 811 500, 2011.

  - Lowne, R.W., "Tyre Failures on Part of M5 Motorway", Transport and Road Research Laboratory, TRRL Report LR 585, Crowthorne, Berkshire, 1973.

  - Robinette, R., Deering, D., and Fay, R., "Drag and Steering Effects of Under Inflated and Deflated Tires," SAE Technical Paper 970954, 1997, doi:10.4271/970954.

  - Tandy, D., Granat, K., Durisek, N., Tandy, K. et al., "Vehicle Response Comparison to Tire Tread Separations Induced by Circumferentially Cut and Distressed Tires," SAE Technical Paper 2007-01-0733, 2007, doi:10.4271/2007-01-0733.

  - Tandy, D., Pascarella, R., Ault, B., Coleman, C. et al., "Steering and Handling Performance During a Full Tire Tread Belt Separation," *SAE Int. J. Passeng. Cars – Mech. Syst.* 4(1):791-806, 2011, doi:10.4271/2011-01-0973.

  - Tandy, D., Ault, B., and Pascarella, R., "Steering and Handling Performance Following a Full Tire Tread Belt Separation," SAE Technical Paper 2012-01-0257, 2012, doi:10.4271/2012-01-0257.

  - Tandy, D., Ault, B., Colborn, J., and Pascarella, R., "Objective Measurement of Vehicle Steering and Handling Performance When a Tire Loses Its Air," *SAE Int. J. Passeng. Cars - Mech. Syst.* 6(2):741-769, 2013, doi:10.4271/2013-01-0748.

  - Wierwille, W.W., Casali, J.G., "Driver Steering Reaction Time to Abrupt-Onset Crosswinds, as Measured in a Moving-Base Driving Simulator," Human Factors: The Journal of the Human Factors and Ergonomics Society**,** February 1983, vol. 25, no. 1103-116, doi: 10.1177/00187208830250011.

- Young, D., Heckman, G., Kim R., "Human Factors in Sudden Acceleration Incidents," Proceedings of the Human Factors and Ergonomics Society Annual Meeting 2011 55: 1938, DOI: 0.1177/1071181311551404.

- In addition to physical evidence, principles of physics and the listed technical literature, I also relied on my experience and education. My experience includes full scale tire disablement testing.

Chevrolet Silverado: The 2003 Chevrolet Silverado pickup (VIN – 1GCEC14X33Z115363) was equipped with a 6-cylinder gasoline engine, two-wheel drive and an automatic transmission. As can be seen in Figure 2, the Silverado exhibits damage consistent with a rollover. The damage to the vehicle as result of tread engagement was typical of a tread separation and consistent with the damage that occurred in my own testing. There was no evidence of significant parking brake engagement. I inspected the Silverado on October 4, 2018. I inspected the subject tire and companion tires and documented accident wear and damage to the tires on November 21, 2018.

Figure 2

Crash Site: Kineticorp inspected the crash site on August 31st, 2018. Figure 3 depicts the crash area. Eastbound I-80 consist of two travel lanes, bordered by asphalt shoulders and depressed grassy median.

Figure 3

Crash Sequence: According to the testimony of Mr. Blair, the Silverado was in the left lane passing another vehicle. After passing the vehicle, Mr. Blair moved from the #1 lane into the #2 lane. During this lane change, Mr. Blair experienced vibrational warnings. The rear right tire then experienced a partial tread detachment. Mr. Blair steered multiple times. He steered his vehicle slightly off the right side of the road, then steered the vehicle to the left, which caused the Silverado to yaw counter-clockwise across both lanes, exit the left side of the road and rollover. I have discussed the crash sequence with Stephen J. Fenton, who reconstructed the crash. According to Mr. Fenton, the Silverado was initially traveling approximately 78 mph. At the start of the tire mark evidence (Position 1 in Figure 4) the Silverado was traveling approximately 74 mph. Mr. Blair applied the throttle before the second position (red arrow) in Figure 4. The Silverado began to rollover at Position 2 at approximately 39 mph. The vehicle rolled approximately 4 times before coming to rest on its tires at Position 3.

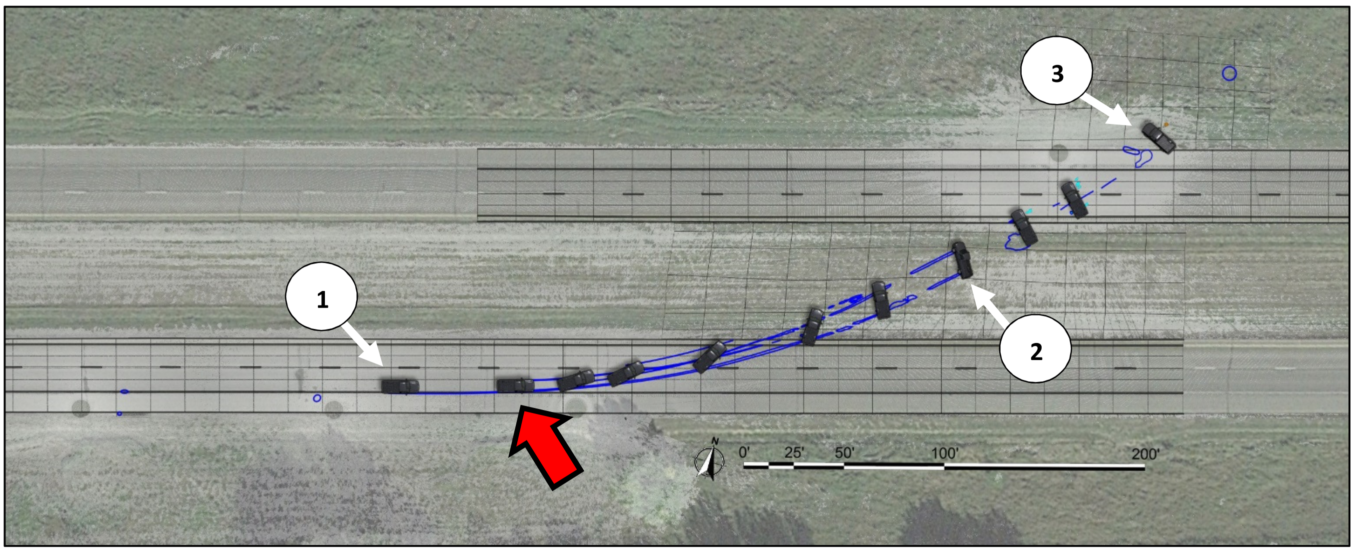

Figure 4

Vehicle Testing Literature: Kineticorp published the results of 29 high speed tire disablement tests with the Society of Automotive Engineers (SAE). These tests included tire tread separations and rapid air loss. When each tread separation began, the driver removed his foot from the accelerator and steered to maintain lane position. In all tests, the vehicle was kept within its lane with steering inputs less than 32 degrees[1,2].

The test series included a 2003 Expedition which was equipped with tires prepared to produce full and partial tread belt separations. The tests were conducted on a two lane, dry asphalt road. During the testing, steering wheel angles of less than 28 degrees kept the Expedition within its lane of travel. The speeds at tread separation during these tests were between 50-78 mph. Figure 5 depicts the Expedition that Kineticorp tested.

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[1] Beauchamp, G., Koch, D., and Thornton, D., "A Comparison of 25 High Speed Tire Disablements Involving Full and Partial Tread Separations," *SAE Int. J. Trans. Safety* 1(2):364-385, 2013, doi:10.4271/2013-01-0776.
[2] Koch, D., Beauchamp, G., and Pentecost, D., "Deceleration Rates of Vehicles with Disabled Tires," SAE Technical Paper 2017-01-1427, 2017, https://doi.org/10.4271/2017-01-1427

Figure 5

Included in our test series was the 2003 Dodge Caravan depicted in Figure 6. In each test, the Caravan was equipped with a rear tire prepared to produce a full or partial tread separation. During the testing, steering wheel angles less than 25 degrees kept the 2003 Caravan within its lane of travel. The tests were conducted at speeds between 55-75 miles per hour.

Figure 6

The findings of our testing were consistent with the findings of other authors who also have performed tread separation testing including Tandy, Gardner, Fay and Klein. [3,45,6] Tandy et al., conducted testing of 17 vehicles and showed that the steering inputs required to keep the vehicle within its lane did not exceed 22 degrees at the steering wheel for rear tread separations. Tandy's test series included the full-size pickup depicted in Figure 7, loaded to its gross vehicle weight rating. The pickup experienced a rear left tread separation at 68 mph. Steering inputs less than 22 degrees kept the vehicle on a straight path.

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[3] Tandy, Donald F., Pascarella, Robert, et al., *Steering and Handling Performance During a Full Tire Tread Belt Separation,* Paper Number 2011-01-0973, Society of Automotive Engineers, 2011.

[4] Gardner, Jim. "The Role of Tread/Belt Detachment in Accident Causation," ITEC 1998, Paper 27A.

[5] Fay, R., Robinette, R., Smith, J., Flood, T. et al., *Drag and Steering Effects from Tire Tread Belt Separation and Loss*, SAE Technical Paper 1999-01-0447, 1999, doi:10.4271/1999-01-0447.

[6] Klein, Ernest Z., *Anatomy of Accidents Following Tire Disablements,* SAE Technical Paper Number 1999-01-0446.

Figure 7

Three compact pickups were included in Tandy's testing, which are depicted in Figure 8. The compact pickups experienced rear tire tread separations at speeds of approximately 69 mph. Steering inputs under 15 degrees kept the vehicle traveling a straight path.

Figure 8

Tandy tested several large SUV's loaded to their gross vehicle weight ratings, including the Expeditions shown in Figure 9. The SUV's experienced a rear right tread separation at 73 mph (top vehicle) and 61 mph (bottom vehicle). Steering inputs of less than 9 degrees kept the vehicles traveling in a straight path.

Figure 9

Two heavy duty SUV's, the Ford Excursions depicted in Figure 10, were also tested by Tandy. The top vehicle in Figure 10 experienced a rear right tread separation at 70 miles per hour while loaded to its Gross Vehicle Weight Rating. Steering inputs of less than 21 degrees kept the 2000 Ford SUV within its lane of travel. The bottom vehicle in Figure 10 experienced a rear right tread separation at 71 miles per hour while at its curb weight. Steering inputs of less than 17 degrees kept the 2002 Ford SUV traveling a straight path.

Figure 10

Gardner performed tire tread separation testing using several vehicles, including a ¾ ton pick-up truck. Gardner remarked that, "the forces developed are within the range that should not deny the driver control over the steering."[7]

In the subject crash, the Silverado likely experienced a small lateral deviation as a result of the tire disablement. The vehicles also experienced small lateral deviations in all my tests and in nearly all tests performed by other researchers. It is these tests, in which the test vehicle's motion is similar to the subject vehicle motion, that are applicable for analyzing the subject crash. In two other dissimilar SUV tests performed by other researchers, the vehicles experienced significantly larger lateral deviations than in the subject crash and in my testing. The vehicle motion that occurred in those tests was substantially different than the vehicle motion that occurred in the subject crash. Therefore, those outlier tests are not applicable to the subject crash and it is misleading to draw comparison between those tests and the subject crash.

Warning Cues: Testimony indicates that a tactile warning preceded any lateral movement of the vehicle as a result of the tire disablement. In each of Kineticorp's tests, noise and vibration preceded any lateral vehicle motion. The noise and vibration indicated that there was a situation that needed to be addressed by the driver. Other researchers have also experienced and documented these warning cues. Tandy conducted testing with a tire that had been distressed, rather than circumferentially cut, by baking the tire in an oven and running it

[7] Gardner, Jim. *The Role of Blowouts in Accident Causation*. Publication no. 87-WA/SAF-4. New York City: American Society of Mechanical Engineers, 1987.

on a dynamometer.[8] The distressed tire was then mounted on a 1999 Ford Explorer and driven at over 70 mph until a tread separation occurred. The distressing process allowed Tandy to generate a tread separation without cutting the tire, similar to what occurs in real world tread separations. Tandy noted that vibrational forces increased in amplitude over the 300 miles of driving prior to the separation. The driver in the subject accident likely experienced vibrational warning cues that should have indicated there was a situation that needed to be addressed by the driver.

Vehicle Handling in the Subject Accident: The forces generated by this tire disablement were not sufficient to force the vehicle out of the driver's control. Kineticorp's own testing has shown that during a tread separation and/or blowout, a driver may experience a minor force that pulls the vehicle in the direction of the disabled tire. However, the vehicle can be kept within its lane with minor corrective steering. In the subject crash, the tire disablement likely pulled the Silverado slightly to the right. A small steering input would have kept the Silverado under the driver's control. Instead, Mr. Blair steered more than was necessary multiple times which caused the Silverado to exit the right side of the road, then yaw across the travel lanes, exit the left side of the road and rollover. Both the physical evidence and the testimony of Mr. Blair are consistent with Mr. Blair first steering to the left, then to the right, which caused the vehicle to cross the right-side fog line. Mr. Blair then steered to the left a second time which caused the vehicle to yaw counterclockwise across both lanes and enter the median. The physical evidence and testimony indicate these steering inputs occurred, however, the specific magnitude, duration and location of the steering inputs could not be determined due to a lack of tire mark evidence early in the sequence. In the final counter-clockwise yaw, the vehicle was pushed to its lateral limit and there were likely a range of large steering inputs that could cause the vehicle to yaw as it did. During my own testing, and in the testing of others, steering inputs less than 32 degrees kept the vehicle traveling a straight path during a rear tread separation. Given that Mr. Blair failed to maintain a straight path, it is likely that he steered more than 32 degrees. During the final yaw, the steering input to the left was likely significantly more than 32 degrees. The CDR report indicates that Mr. Blair applied the throttle near the beginning of the tire mark evidence, which was improper. In general, throttle application in this rear wheel drive vehicle would amplify any yaw motion compared to steering alone and make it more difficult for Mr. Blair to maintain a straight path. It could not be ruled out that Mr. Blair's application of the throttle contributed to him losing control of his vehicle.

If large steering inputs are made, most vehicles can spin out at their limits when a tire without tread and/or without air is at a rear tire position. However, the steering inputs necessary to keep the vehicle under the driver's control during a tire disablement are typically much less than steering inputs that would cause the vehicle to spin out. Therefore, vehicles with disabled tires at a rear position can be handled without issue, so long as large steering inputs are not made by the driver. It should be noted that large steering inputs at high speed are not advisable or normal, even with four new tires with new tread. Even understeer vehicles with all new tires can spin out at their limits with certain combinations of driver inputs, roadway surface conditions, and vehicle loading conditions.

Tire disablements seldom result in crashes.[9,10,11,12,13] Therefore, during a tire disablement event certain factors other than the tire disablement itself typically contribute to a driver losing control. NHTSA found that 95% of single vehicle run-off-road crashes were driver related.[14] Given the prevalence of driver error as a cause of

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[8] Tandy, D., Granat, K., Durisek, N., Tandy, K. et al., "Vehicle Response Comparison to Tire Tread Separations Induced by Circumferentially Cut and Distressed Tires," SAE Technical Paper 2007-01-0733, 2007, doi:10.4271/2007-01-0733.

[9] Klein, Ernest Z., "Anatomy of Accidents Following Tire Disablements," SAE Technical Paper Number 1999-01-0446.

[10] Baker, J. Stannard, "Tire Disablements and Accidents on a High-Speed Road," The Traffic Institute's Tire Study, April 1968.

[11] Gardner, Jim, "The Role of Tread/Belt Detachment in Accident Causation," ITEC 1998, Paper 27A.

[12] Gardner, J.D., Queiser, B.J., 2006. *The Pneumatic Tire*, Report DOT HS 810 561, US Department of Transportation, National Highway Traffic Safety Administration, Washington, DC, USA, February 2006, ch 15.

[13] Lowne, R.W., "Tyre Failures on Part of M5 Motorway," Transport and Road Research Laboratory, Crowthorne, Berkshire, 1973.

[14] Liu, C., Ye, T.J., *Run-Off-Road Crashes: An On Scene Perspective,* NHTSA DOT HS 811 500, 2011.

run-off-road crashes generally, driver error would certainly be among the factors that contribute to loss of control during a tire disablement. This crash was caused by the driver's steering and his failure to control the Silverado. The improper throttle application by the driver may also have contributed to the loss of control.

Tire disablements are different than obstacle avoidance scenarios. The steering inputs required to keep a vehicle within its lane of travel during a tread belt detachment are minor. By comparison, steering inputs used by drivers to avoid obstacles can be relatively large. The fact that some drivers may use large steering inputs to avoid obstacles is inapplicable to the subject crash.

<u>Discussion – NADS Study</u>: I have examined the study conducted in the National Advanced Driving Simulator (NADS) at the University of Iowa.[15] This study was conducted to investigate drivers' reactions to tread separation scenarios. The study was conducted in a simulator, not in an actual vehicle. Specifically, the study looked at whether prior warning of the tire event or initial vehicle understeer gradient had any effect on crash rates. A full copy of the test procedures and results, including video of the individual tests, were obtained through a Freedom of Information Act request. In viewing the videos and test report, several shortcomings of the study were identified in attempting to simulate tread separation events. The authors even warn of generalizing this study's findings to the real world, "…the ability to generalize the above conclusions to specific vehicles is limited. Generalization is also constrained by the assumption that the tire detread event is accurately simulated and that driver responses in the simulator correspond to what they would do in the real world." Due to the limitations of the simulator when studying the lane maintenance task, the unrealistically modeled tread separation event, the artificial verbal cues given to the subjects, and the incorrectly and invalidated post separation vehicle handling characteristics, the findings of the NADS study are not applicable to the subject crash.

Review of videos from the NADS study revealed that some drivers had difficulty maintaining their lane of travel even before any tire event occurred. Presumably, these subjects could keep their real vehicles within their lane in the real world, but could not in the simulator. The failure to maintain lane position is likely due to time delays and other differences between driving a simulated vehicle and an actual vehicle in the real world. These differences also contribute to some participants becoming nauseous when driving the simulator, forcing some subjects to be excused from simulator studies. A tire disablement is, in simplistic terms, a lane maintenance task. There is an obvious problem in attempting to study tire disablement crash rates when subjects struggle to maintain lane position in a vehicle with tread on all four tires.

The tread separation in the NADS simulator was not modeled accurately. In all of my tire disablement tests, there was noise and vibration and the vehicle likely pulled slightly towards the side with the disablement. All of the tests required steering to maintain lane position. In the simulator, the vehicle did not pull and many drivers were unaware that anything had happened when the tire event occurred.

There were three vehicles used in the simulator, and only *Vehicle 1* was based on a real vehicle (Jeep Cherokee). Thirty-six subjects drove *Vehicle 1* during the unexpected tread separation simulation (no warning was given to these subjects that a tread separation would occur). When the tread separation was simulated, the driver heard noise, and the properties of the subject tire were mathematically altered within the simulator. If the subject didn't respond (35 of 36 subjects took no action), then the driver heard a voice within the cab say, "You have experienced a tire failure, please drive as you normally would your own vehicle during a tire failure," or a similar command. Of the 36 subjects, 30 maintained control of their vehicles. For the 6 that did lose control, only one lost control without being prompted verbally to take action, and this subject demonstrated difficulty maintaining his lane prior to the tread separation event. Some of the subjects drove the vehicle for up to 30 seconds without

[15] Ranney, Thomas A., et al., *Investigation of Driver Reactions to Tread Separation Scenarios in the National Advanced Driving Simulator (NADS)* U.S. Department of Transportation, National Highway Traffic Safety Administration, DOT HS 809 523, January 2003.

issue and only lost control when given the verbal cue. The tread separation itself, and the verbal instructions, are not representative of real word tire disablements. Therefore, the findings the authors reached about controllability and crash rates do not apply to real world disablements.

The authors of the study used a Jeep Cherokee model in the simulator that had been previously validated for some maneuvers, and tire data from a tire test device as the basis of the altered tire properties. However, the authors failed to validate the vehicle with a separated tire or with a variety of maneuvers. Without this validation, there lacks confidence that a steering input in the simulated Jeep with a separated tire would produce the same vehicle motion as a Jeep Cherokee in the real word with a separated tire. After the tread had separated in the study, the tire's properties were altered. Specifically, the cornering stiffness of the subject tire was reduced. The reduction made the vehicle highly unstable, and drivers lost control with unrealistically small steering inputs. This overly sensitive steering condition does not occur in the real world. Vehicles can be driven easily with all the tread removed from a rear tire. This was discussed extensively in two SAE publications.[16,17]

The NADS study found that subjects driving vehicles with lower initial understeer gradients (and lower understeer gradient after the tire event) were more prone to losing control of their vehicles. As stated previously, only *Vehicle 1* was based on a real vehicle. *Vehicles 2 and 3* were mathematically modified to have lower understeer gradients. In the study, *Vehicles 2 and 3* were even more sensitive to steering inputs than *Vehicle 1*, which was already unrealistically sensitive. Therefore, the fact that more drivers lost control of *Vehicle 3* than any other is not surprising.

Closing: The opinions and conclusions expressed in this report were reached to a reasonable degree of engineering certainty based on our investigation and analysis to date. I reserve the right to amend and/or supplement the conclusions contained in this report if additional materials become available. I may create additional materials for use at trial. I may use video of our tire tread separation testing at trial.

Sincerely,

Gray Beauchamp, M.S., P.E.
Principal Engineer

COLORADO LICENSED
ARTHUR GRAY BEAUCHAMP
43741
PROFESSIONAL ENGINEER

[16] Rucoba, Robert, et al., *An analysis of Driver Reactions to Tire Failures Simulated with the National Advanced Driving Simulator (NADS).* Sixth International Driving Symposium on Human Factors in Driver Assessment, Training and Vehicle Design. 2011.
17 Rucoba, R., Liebbe, R., Duran, A., and Carr, L., "The Effectiveness of the National Advanced Driving Simulator (NADS) in Evaluating the Effect of Tire Tread Belt Detachments," SAE Technical Paper 2013-01-0467, 2013, doi:10.4271/2013-01-0467.

Appendix A

<u>List of Provided Documents</u>
Susman v Goodyear

- **Police**
  - State of Nebraska, Investigator's Motor Vehicle Accident Report
  - Nebraska State Patrol Incident Report
  - Police Overlay
  - Call History

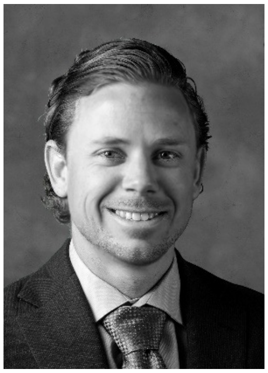
- **Photographs**
  - Accident Scene Photos - 35 images
  - Nebraska State Patrol Photos - 27 images
  - FBL Financial Photos – 24 images

- **Deposition Transcripts** ***(with Exhibits*)***
  - Daniel Bueser, Dated October 23, 2018
  - Jacob Summers, Dated October 24, 2018
  - Larry Blair, incl Video Deposition, Dated February 7, 2019
  - Micky Gilbert, Dated April 16, 2019 *
  - Jacob Summers, incl Video Deposition, Dated October 24, 2018

- **Expert Reports**
  - Micky Gilbert Expert Report, Dated March 12, 2019
  - Micky Gilbert Expert File Materials - 5,247 files, 243 folders

- **Legal Documents**
  - Complaint

- **Other Documents**
  - CDR Data: VIN# 1GCEC14X33Z115363
  - FBL Financial Docs – File Notes Caption Report (4)
  - Larry Blair, Good Samaritan Hospital, Discharge Summary
  - Shane Loveland, Alcohol Analysis
  - Shane Loveland, Negative Urine Drug Screen Analysis
  - Jacob Summers, Good Samaritan Hospital, History & Physical Forms
  - Jacob Summers, UNMC Nebraska Medicine, Lab Orders and Results
  - Dandee Concrete Construction Company Documents
  - Kearney Towing and Repair Documents
  - Jacob Summers, Alcohol Analysis



Résumé of
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EXPERIENCE: Principal Engineer, Senior Engineer, and Engineer, Kineticorp, LLC, Denver, Colorado, April 2005 to Present
Engineer, Knott Laboratory, Inc., Centennial, Colorado, January 2003 to March 2005

EDUCATION: **M.S. Mechanical Engineering,** University of Colorado, Denver, 2015
B.S. Mechanical Engineering, Biomedical emphasis, University of Colorado, Boulder, 2002

REGISTRATIONS: Mr. Beauchamp is registered as a Professional Engineer in the State of Colorado. He is an accredited Traffic Accident Reconstructionist through the Accreditation Commission for Traffic Accident Reconstruction (ACTAR).

ENGINEERING: Mr. Beauchamp is an expert in traffic accident reconstruction and Vehicle Dynamics and has investigated and reconstructed hundreds of vehicular accidents. Some specific examples of Mr. Beauchamp's experience are listed below:

- Mr. Beauchamp is an active member of the Society of Automotive Engineers (SAE). He is a peer reviewer for technical papers published in the rollover session, the accident reconstruction session, and in the Analysis, Synthesis, and Design of Advanced Suspensions session of SAE. He regularly presents his own research at the annual World Congress in Detroit Michigan.
- Mr. Beauchamp is an instructor for SAE's Reconstruction and Analysis of Rollover Crashes of Light Vehicles course. He has guest lectured on Accident Reconstruction at the Denver Police Department for officers training in the Level 3 Advanced Traffic Collision Investigation and Reconstruction Course. He has also guest lectured at the graduate level at the University of Colorado and Wayne State University.
- Mr. Beauchamp has performed full scale vehicle testing including rollover testing on a public highway in Utah, high speed tire disablement testing, high speed yaw testing and P.I.T (Pursuit Intervention Technique) testing with the Denver Police Department at their training facility in Denver, Colorado.
- Mr. Beauchamp specializes in single vehicle loss of control accidents. This includes both driver loss of control and vehicle rollovers. He has published numerous publications on these topics and has given lectures regarding these types of accidents.
- Mr. Beauchamp also specializes in heavy truck systems, including air brake systems, to determine their condition and relevance to an accident. He has completed numerous seminars on the topics of commercial vehicle accidents, air brake systems, and out-of-service criteria.
- Mr. Beauchamp analyzes occupant kinematics, including occupant motion and seat belt usage, in a variety of different accidents, including bus accidents and vehicle rollovers. He has also published with SAE on the topic of occupant ejection.
- Mr. Beauchamp has investigated accidents involving a variety of vehicles including tractor-trailers, buses, railway vehicles, farm equipment and animals, motorcycles, bicycles and passenger cars. Many of these accidents also involved pedestrians.
- Within the SAE, Mr. Beauchamp participated in the Accident Investigation and Reconstruction Practices Committee (AIRP) which drafted standards and recommendations regarding accident reconstruction. Additionally, he participated in three subcommittees within AIRP; the Critical Speed Taskforce, the EDR Working Group, and the Animation Committee.

RESEARCH: Mr. Beauchamp's current and past areas of research include rollover dynamics, crush energy analysis, vehicle handling, pneumatic tire disablement, and heavy truck braking. For his Master's Degree, Mr. Beauchamp's final project focused on how braking and steering inputs by the driver affect the specific tire marks that are deposited by a yawing vehicle. Seven of Mr. Beauchamp's publications have been included in the SAE International Journal of Passenger Cars. As stated by SAE, "Only those outstanding and archival technical papers which either advance the state of the art or insightfully piece together prior research in ways which increase automotive understanding are selected for inclusion in this journal."[1]

OTHER INTERESTS: Mr. Beauchamp is a licensed motorcycle rider. He is an avid snowmobile rider, snow skier and mountain biker.

PROFESSIONAL AFFILIATIONS: SAE - Society of Automotive Engineers; The Tire Society; INCR - International Network of Collision Reconstructionists.

[1] "SAE International Journal of Passenger Cars - Mechanical Systems – Electronic Version." *Books.sae.org.* SAE, May 2012. Web. 22 March 2013

Gray Beauchamp, M.S., P.E.
Principal Engineer

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Publications

1. Koch, D., **Beauchamp, G.**, and Pentecost, D., "Deceleration Rates of Vehicles with Disabled Tires," SAE Technical Paper 2017-01-1427, 2017, doi:10.4271/2017-01-1427.

2. **Beauchamp, G.,** Pentecost, D., Koch, D., and Rose, N., "The Relationship Between Tire Mark Striations and Tire Forces," *SAE Int. J. Trans. Safety*4(1):134-150, 2016, doi:10.4271/2016-01-1479.

3. **Beauchamp, G.,** Thornton, D., Bortles, W., and Rose, N., "Tire Mark Striations: Sensitivity and Uncertainty Analysis," *SAE Int. J. Trans. Safety*4(1):121-127, 2016, doi:10.4271/2016-01-1468.

4. Rose, N., Carter, N., and **Beauchamp, G.,** "Post-Impact Dynamics for Vehicles with a High Yaw Velocity," SAE Technical Paper 2016-01-1470, 2016, doi:10.4271/2016-01-1470.

5. **Beauchamp, G.,** Koch, D. and Thornton, D. E., "A Comparison of 25 High Speed Tire Disablements Involving Full and Partial Tread Separations," *SAE Int. J. Trans. Safety* 1(2):2013, doi:10.4271/2013-01-0776.

6. Carter, N., **Beauchamp, G.**, Rose, N. A. "Comparison of Calculated Speeds for a Yawing and Braking Vehicle to Full-Scale Vehicle Tests," Paper Number 2012-01-0620, Society of Automotive Engineers, Warrendale, PA, 2012.

7. Rose, N. A., **Beauchamp, G.**, "A Variable Deceleration Rate Approach to Rollover Crash Reconstruction," *Collision Magazine*, Volume 5, Issue 1, Spring 2010.

8. **Beauchamp, G.**, Hessel, D., Rose, N. A., Fenton, S. J., "Determining Steering and Braking Levels from Yaw Mark Striations," *SAE Int. J. Passeng. Cars – Mech. Sys* **2**(1):291-307 (SAE Paper Number 2009-01-0092), 2009.

9. Rose, N. A., **Beauchamp, G.**, "Development of a Variable Deceleration Rate Approach to Rollover Crash Reconstruction," *SAE Int. J. Passeng. Cars – Mech. Sys* **2**(1):308-332 (SAE Paper Number 2009-01-0093), 2009.

10. Rose, N. A., **Beauchamp, G.**, "Analysis of a Dolly Rollover with PC-Crash," Paper Number 2009-01-0822, Society of Automotive Engineers, 2009.

11. Rose, N. A., **Beauchamp, G.**, Fenton, S. J., "The Influence of Vehicle-to-Ground Impact Conditions on Rollover Dynamics and Severity," 2008-01-0194, Society of Automotive Engineers, Warrendale, PA, 2008.

12. Rose, N. A., Fenton, S. J., **Beauchamp, G.**, "Analysis of Vehicle-to-Ground Impacts during a Rollover with an Impulse-Momentum Impact Model," *SAE Int. J. Passeng. Cars – Mech. Sys.* **1**(1):105-123 (SAE Paper Number 2008-01-0178), 2008.

13. Funk, J. R., **Beauchamp, G.**, Rose, N. A., Fenton, S. J., Pierce, J., "Occupant Ejection Trajectories in Rollover Crashes: Full-Scale Testing and Real World Cases," *SAE Int. J. Passeng. Cars – Mech. Sys.* **1**(1):43-54 (SAE Paper Number 2008-01-0166), 2008.

14. Rose, N. A., **Beauchamp, G.**, Fenton, S. J., "Factors Influencing Roof-to-Ground Impact Severity: Video Analysis and Analytical Modeling," 2007-01-0726, Society of Automotive Engineers, Warrendale, PA, 2007.

15. Rose, N. A., **Beauchamp, G.**, Bortles, W., "Quantifying the Uncertainty in the Coefficient of Restitution Obtained with Accelerometer Data from a Crash Test," 2007-01-0730, Society of Automotive Engineers, Warrendale, PA, 2007.

16. Rose, N. A., **Beauchamp, G.**, Fenton, S. J., "Restitution Modeling for Crush Analysis: Theory and Validation," 2006-01-0908, Society of Automotive Engineers, Warrendale, PA, 2006.

Instructor

1. "Reconstruction and Analysis of Rollover Crashes of Light Vehicles," Society of Automotive Engineers Course C1502, Instructor, 8-hour course taught on April 9, 2018, Detroit, MI.

2. "Reconstruction and Analysis of Rollover Crashes of Light Vehicles," Society of Automotive Engineers Course C1502, Instructor, 8-hour course taught on December 1, 2016, Norwalk, CA.

3. "Reconstruction and Analysis of Rollover Crashes of Light Vehicles," Society of Automotive Engineers Course C1502, Instructor, 8-hour course taught on September 29, 2016, Scottsdale, AZ.

4. "Tire Mark Forensic Evidence," Guest Lecturer, Wayne State University, BME 7810 – Forensic Bioengineering, Detroit, MI, April 14, 2010.

5. "Tire Marks Deposited Preceding and Subsequent to Vehicular Impacts," Guest Lecturer, University of Colorado at Denver, ME 4238/5238 – Impact Mechanics, Denver, CO, June 30, 2009.

6. "Level 3 Advanced Traffic Collision Investigation and Reconstruction," Instructor, Denver Police Department, Denver, CO, September 29, 2009.

7. "Level 3 Advanced Traffic Collision Investigation and Reconstruction," Instructor, Denver Police Department, Denver, CO, October 2, 2008.

Presentations

8. "Science and Technology in the Courtroom – Tips From the Experts," American Bar Association – Transportation Megaconference XIII Trucking and Motor Carrier Litigation, New Orleans, LA, March 10, 2017.

9. "Tire Mark Striations: Sensitivity and Uncertainty Analysis," SAE Technical Paper Presentation, 2016 Society of Automotive Engineers World Congress, Detroit, MI, April 13, 2016.

10. "The Relationship Between Tire Mark Striations and Tire Forces," SAE Technical Paper Presentation, 2016 Society of Automotive Engineers World Congress, Detroit, MI, April 13, 2016.

11. "Testing the Validity of Myths Surrounding Tire Failures," American Bar Association – 2015 Emerging Issues in Motor Vehicle Product Liability Litigation, Phoenix, AZ, April 9, 2015.

12. "A Comparison of 25 High Speed Tire Disablements Involving Full and Partial Tread Separations," SAE Technical Paper Presentation, 2013 Society of Automotive Engineers World Congress, Detroit, MI, April 17, 2013.

13. "The Controllability of Various Tire Disablements: 25 High Speed Tests," American Bar Association – 2013 Emerging Issues In Motor Vehicle Product Liability Litigation, Phoenix, AZ, April 4, 2013.

14. "Severity Underreported: The Accident May Be More Severe Than You Think," American Bar Association – 2011 Emerging Issues in Motor Vehicle Product Liability Litigation, Phoenix, AZ, April 1, 2011.

15. "Development of a Variable Deceleration Rate Approach to Rollover Crash Reconstruction," SAE Technical Paper Presentation, 2009 Society of Automotive Engineers World Congress, Detroit, MI, April 22, 2009.

16. "Determining Steering and Braking from Yaw Mark Striations," SAE Technical Paper Presentation, 2009 Society of Automotive Engineers World Congress, Detroit, MI, April 21, 2009.

17. "Accident Reconstruction: Heavy Trucks," Morison Ansa Holden Assuncao & Prough LLP, Philadelphia, PA, June 2, 2008.

18. "Guardrail and Barrier Impacts," Caltrans Legal Department, Los Angeles, CA, August 7, 2007.

19. "Factors Influencing Roof-to-Ground Impact Severity: Video Analysis and Analytical Modeling," SAE Technical Paper

Presentation, Society of Automotive Engineers World Congress, Detroit, Michigan, April 17, 2007.

20. "Impaired Driver Awareness," Center for Transportation Safety, Fort Collins Colorado, March 24, 2005.

Technical Conferences and Seminars

1. Society of Automotive Engineers World Congress, Detroit, Michigan, April 2016.
2. "Applying Automotive EDR Data to Traffic Crash Reconstruction," Society of Automotive Engineers, Norwalk, CA, December 6-9, 2015.
3. "Advanced Vehicle Dynamics for Passenger Cars and Light Trucks," Society of Automotive Engineers, Troy, Michigan, October 29-31, 2014.
4. Society of Automotive Engineers World Congress, Detroit, Michigan, April 2013.
5. "Human Factors in Traffic Crashes," Presented by Jeff Muttart, Northwestern University, West Chester, Ohio, November 5 – 9, 2012.
6. Society of Automotive Engineers World Congress, Detroit, Michigan, April 2012.
7. "Crash Data Retrieval (CDR) Technician – Level 1," Course Presented by William Bortles, Greenwood Village, Colorado, March 8, 2011.
8. "Crash Data Retrieval (CDR) Technician – Level 2," Course Presented by William Bortles, Greenwood Village, Colorado, March 8, 2011.
9. Society of Automotive Engineers World Congress, Detroit, Michigan, April 2010.
10. "CVSA Seminar," Colorado Motor Carriers Association, Denver, Colorado, August 27, 2009.
11. Society of Automotive Engineers World Congress, Detroit, Michigan, April 2009.
12. "2008 SAE Government/Industry Meeting," Society of Automotive Engineers, Washington, DC, May 13, 2008.
13. "VBOX Product Training," VBOX USA, Denver, CO, April 21, 2008.
14. "Tire Mechanics & Modeling," 1-Day Course Presented by Dr. Patrick Fitzhorn, Director of the Race Vehicle Dynamics Laboratory at Colorado State University, March 20, 2008.
15. "Tire and Wheel Safety Issues," Society of Automotive Engineers, Greenville, SC, June 22, 2007.
16. "Tire as a Vehicle Component," Society of Automotive Engineers, Greenville, SC, June 21, 2007.
17. "Basic Rider Course," T3RG Motorcycle Class, Denver, CO, May, 2007.
18. Society of Automotive Engineers World Congress, Detroit, Michigan, April 2007.
19. "Active Safety Technology: Paving the Road to Accident-Free Driving Telephone/Webcast," Society of Automotive Engineers, March 1, 2007.
20. CarSim 7 Training Session, Presented by Thomas Gillespie of Mechanical Simulation Corporation via Teleconference, December 13, 2006.
21. "Vehicle Dynamics for Passenger Cars and Light Trucks," Society of Automotive Engineers, Troy, Michigan, August 23-25, 2006.
22. "CVSA Critical Inspection Seminar," Colorado Motor Carriers Association, Denver, Colorado, July 27, 2006.

23. "Bendix Comprehensive Air Brake Systems Training," Bendix Corporation, Denver, Colorado, May 9-11, 2006.

24. "Inspection and Investigation of Commercial Vehicle Crashes," Institute of Police Technology and Management, Tempe AZ, December 8-12, 2003.

2019 RATE SHEET

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	Hourly Rate	
Stephen J. Fenton	$	425.00
William T.C. Neale	$	300.00
Nathan A. Rose	$	300.00
David Danaher	$	260.00
Gray Beauchamp	$	260.00
William Bortles	$	220.00
Neal Carter	$	220.00
Toby Terpstra	$	210.00
Jason Zeitler	$	205.00
James Marr	$	195.00
Dana Thornton	$	195.00
David Hessel	$	190.00
Jordan Dickinson	$	180.00
Alireza Hashemian	$	155.00
David Pentecost	$	155.00
Sean M. McDonough	$	155.00
George Rayburn	$	150.00
Daniel Koch	$	145.00
Steven Beier	$	145.00
Martin Randolph	$	140.00
Connor Smith	$	140.00
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Justin Holderness	$	135.00
Tomas Owens	$	130.00
Seth Miller	$	130.00
Robert Gillihan	$	130.00
Nathan McKelvey	$	130.00
Nicholas Sousa	$	120.00
Eric King	$	115.00
Renee Brumbaugh	$	115.00
Tegan Smith	$	115.00
Ethan Benninger	$	100.00
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Expert Testimony For Mr. Gray Beauchamp Since 2014

Testified	Trial	Hrng	Arb	Depo	Job Number	Job Name	Description	Case No.	Dist/City/St.	Plaintiff	Defence
2014											
7/18/2014				X	2255-0414	Donovan	Liljeberg v. Continental Tire	2:11-cv-00510-WKW-TFM	District Court, Middle District of Alabama Northern Division		X
10/3/2014				X	2276-0514	Stauss	Velazquez/Santiago v. Goodyear Tire	A-12-664513-C	District Court, Clark County, Nevada		X
10/3/2014				X	2347-0814	Goodnight	Stephens v. Gulick Trucking, Inc.	4:14-cv-00137-JED-PJC	District Court, Northern District of Oklahoma		X
12/4/2014				X	2251-0314	Edwards	Biggers v. Continental Tire North America, Inc.	D-1-GN-08-003060	District Court, 53rd Judicial District Travis County, Texas		X
12/9/2014	X				2163-1013	Callahan	Scott v. Hercules Painting Company	3654	Philadelphia County Court of Common Pleas		X
Year Count	**1**	**0**	**0**	**4**							
2015											
3/3/2015				X	2413-0314	Monk	Janjua v. Cooper Tire & Rubber Company	WMN-12-2652	District Court, District of Maryland Northern Division		X
7/7/2015				X	2481-0315	Brosseau	Mathers v. Bridgestone Tire	652013CA000392 CAAXMX	Circuit Court of the Second Judicial Circuit for Wakulla County, Florida		X
8/28/2015				X	2550-0615	Nowak	Soucy v. Nova Guides	14-cv-01766 MEH	United States District Court, District of Colorado		X
Year Count	**0**	**0**	**0**	**3**							
2016											
5/25/2016				X	2408-1114	Cutt	Heimuli v. Zions First National Bank, Inc.	Arbitration	Arbitration	X	
8/31/2016				X	2827-0516	Vancil	De La Rosa v. Cooper Tire & Rubber Company	D -101-CV-2014-02574	State of New Mexico, County of Sante Fe		X
9/14/2016				X	2781-0316	Warburton	Bice v. Cooper Tire & Rubber Company	3:15-cv-00862	United States District Court For the Middle District of Tennessee, Nashville Division		X
10/10/2016			X		2408-1114	Cutt	Heimuli v. Zions First National Bank, Inc.	Arbitration	Arbitration	X	
12/8/2016				X	2737-0116	Taylor	Below v. Yokohama Tire Corporation	3:15-cv-00529-wmc	United States District Court Western District of Wisconsin		X
Year Count	**0**	**0**	**1**	**4**							
2017											
2/2/2017				X	2864-0616	Brosseau	Garcia v. Ford, Bridgestone Americas, Inc.	2012-DCL-5269-A	District Court of Cameron County, Texas		X
3/8/2017	X				2737-0116	Taylor	Below v. Yokohama Tire Corporation	3:15-cv-00529-wmc	United States District Court Western District of Wisconsin		X
5/3/2017				X	2696-1115	Taylor	Serrano-Campbell v. Cooper Tire & Rubber Company	14-02-23253-CVW	District Court of Ward County, Texas		X
11/7/2017				X	3139-0517	Goodnight	Clift v. David Panther and United Parcel Service, Inc.	5:16-cv-01096-R	United States District Court Western District of Oklahoma		X
Year Count	**1**	**0**	**0**	**3**							
2018											
1/22/2018				X	3227-0917	Albright	Kintanar v. City of Chicago	10 L 013029	Circuit Court of Cook County, Illinois		X
5/24/2018				X	3140-0517	Brosseau	Tondryk v. Bridgestone	09-CV-17-233	State of Minnesota District Court County of Carlton Sixth Judicial District		X
8/16/2018				X	3042-0217	Davis	Pineda v. Waste Management	2017-005706-CA-01 (13)	Circuit Court of the 11th Judicial Circuit in and for Dade County, Florida	X	
8/22/2018				X	2697-1115	Crawford	Porras v. FF&E Logistical, Inc.	A-16-740121-C	District Court, Clark County, Nevada		X
Year Count	**0**	**0**	**0**	**4**							
2019											
2/27/2019	X				3086-0417	Delany	Terrance L. Johnson v. Armour & Sons Electric, Inc., et al.	B5S7498-002	Philadelphia County Court of Common Pleas - No. 170302692		X
3/19/2019	X				2948-0916	Strott	Compann v. CEMEX	SC13CV774	In the State Court of Forsyth County, State of Georgia		X
4/3/2019				X	2974-1116	Dougherty	Williams v. Kumho Tire	CV-2014-360-2	In the Circuit Court for Jefferson County, Arkansas		X
Year Count	**2**			**1**							

Total for Mr. Beauchamp Since 2014

Trial	Hrng	Arb	Depo	TOTAL
4	**0**	**1**	**19**	**24**